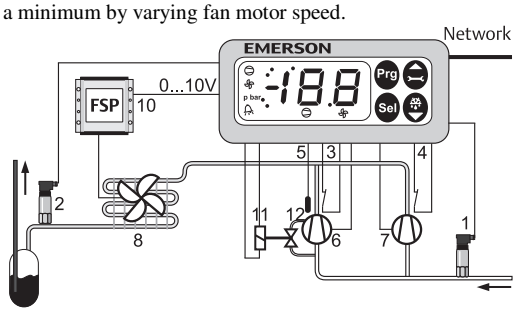
# EC2-552 Condensing Unit Controller

**Operating Instructions**

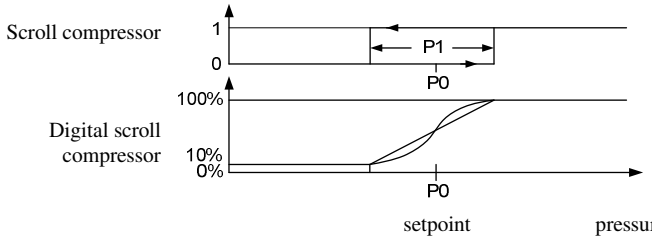
GB

**Note: This document contains short form instructions for experienced users. Use last column in List of Parameters to document your individual settlings. More detailed information can be found in the User Manual.**

The **EC2-552** has been designed to control single compressor or tandem compressor condensing units with a Copeland Scroll Digital™ compressor and variable fan speed control. The purpose of the controller is to maintain suction pressure at a pre-defined level by modulating compressors and to keep condensing pressure to a minimum by varying fan motor speed.

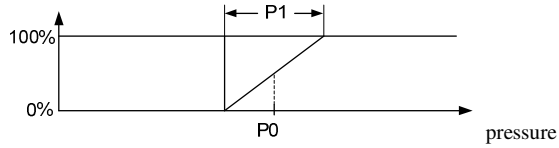



The Alco Controls PT5 pressure transmitter (1) senses **suction pressure**. The Digital Scroll Compressor (6) operates as the base load compressor. Capacity modulation is achieved by temporarily unloading the compressors scroll sets with the Pulse Width Modulated (PWM) signal (11) which controls the compressor unloading valve (12). In tandem compressor condensing units, the single stage compressor (7) will only be turned on when demand exceeds the refrigeration capacity of the Digital Scroll Compressor. The discharge temperature thermistor of the Digital Scroll Compressor should be connected to the Disch. Temp. input (5) of the controller and the volt-free digital inputs (3) and (4) should be connected to the serial alarm loops of both compressors for feedback of compressor tripping.




2 control loops with the same suction pressure setpoint P0 modulate the compressors. The dead band control loop with dead band P1 switches the single stage compressor on or off, whereas a PI control loop modulates the Digital Scroll base load compressor between approximately 10% and 100% capacity. Being the base load compressor, the Digital Scroll Compressor will never be switched off while the single stage compressor remains on.

The PT5 pressure transmitter (2) senses **condensing pressure** and feeds the signal into a control loop which generates a 0…10V output signal (10) to modulate condenser fan motor speed by using the Alco Controls FSP Fan Speed Power Module. The control algorithm for condensing pressure is generating a proportional transfer characteristic:




P0 is the condensing pressure setpoint for the fan. P1 is the proportional pressure band within the fan speed is controlled proportional.

## ⚠ Safety instructions:

- **Read installation instructions thoroughly. Failure to comply can result in device failure, system damage or personal injury.**
- **The product is intended for use by persons having the appropriate knowledge and skills.**
- **Ensure electrical ratings per technical data are not exceeded.**
- **Disconnect all voltages from system before installation.**
- **Keep temperatures within nominal limits.**
- **Comply with local electrical regulations when wiring**

## Technical data:

| | |
|---|---|
| Power supply | 24VAC ±10%; 50/60 Hz; Class II |
| Power consumption | 20VA max. |
| Communication | TCP/IP Ethernet 10MBit/s |
| Plug-in connector size | Removable screw terminals<br>wire size 0.14 … 1.5 mm² |
| Temperature<br>storage<br>operating | <br>-20 … +65°C<br>0 … +60°C |
| Humidity | 0 … 80% rh. non condensing |
| Protection class | IP65 (front protection with gasket) |
| Pressure transmitter inputs | 24VDC, 4…20mA |
| Digital inputs | Volt free contacts 5V/0,1mA |
| Variable fan speed output | 0…10V, 3mA max |
| Triac output | 24VAC 0,1…1A |
| Output relays | SPDT contacts, AgCdO<br>Inductive (AC15) 250V/2A<br>Resistive (AC1) 250V/8A; 12A total return current |
| Marking | AB28 |

## Mounting

The EC2-552 can be mounted in panels with a 71 x 29 mm cutout. See dimensional drawing below for space requirements including rear connectors.

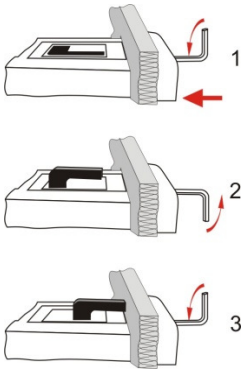
Push controller into panel cutout.(1)

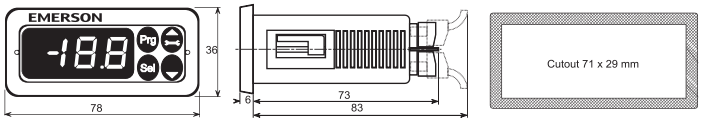
Make sure that mounting clamps are flush with outside of controller housing

Insert allen key into front panel holes and turn clockwise. Mounting clamp will turn and gradually move towards panel (2)

Turn allen key until mounting clamp barely touches panel. Then move other mounting clamp to the same position (3)

Tighten both sides very carefully until controller is secured. Do not over tighten as mounting clamps will break easily.



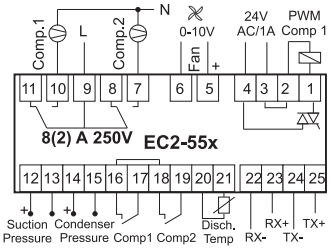




## Electrical Installation

Refer to the electrical wiring diagram (right) for electrical connections. A copy of this diagram is labelled on the controller.

Use connection wires/cables suitable for 90°C operation (EN 60730-1)

EC2 analog inputs are for dedicated sensors only and should not be connected to any other devices. Volt free digital inputs should only be connected to serial control loops or relays with gold contacts. They should not be connected to any other devices




**Important:** Keep controller and sensor wiring well separated from mains wiring. Minimum recommended distance 30mm.

**Warning:** Use a class II category transformer for 24VAC power supply (EN 60742). Do not ground the 24VAC lines. We recommend to use one transformer per EC2 controller and to use separate transformers for 3rd party controllers, to avoid possible interference or grounding problems in the power supply. Connecting any EC2 inputs to mains voltage will permanently damage the EC2.

## Set-up and Parameter Modification Using The Keypad

For convenience, an infrared receiver for the optional **IR remote control unit** is build-in, enabling quick and easy modification of the system parameters when a computer interface is not available.
Alternatively, the parameters can be accessed via the 4-button keypad. The configuration parameters are protected by a numerical password. The default password is "12". To select the parameter configuration:

- Press the **PRG** button for more than 5 seconds
- A flashing 0 is displayed
- Press ▲ or ▼ until 12 is displayed; (password)
- Press **SEL** to confirm password
- The first modifiable parameter code is displayed (/1).
- To modify parameters see "Parameter Modification" below.

## Parameter Modification: Procedure

- Press ▲ or ▼ to show the code of the parameter that has to be changed;
- Press **SEL** to display the selected parameter value;
- Press ▲ or ▼ to increase or decrease the value;
- Press **SEL** to temporarily confirm the new value and display its code;

Repeat the procedure from the beginning "*press* ▲ or ▼*to show...*"

To exit and save the new settings:
Press **PRG** to confirm the new values and exit the parameters modification procedure.
To exit without modifying any parameter:

- Do not press any button for at least 60 seconds (TIME OUT).
- Press "ESC" on IR remote control.

## Temporary Display Of Data:

It is possible to temporarily display the values of the different sensors. This is a useful feature when initially setting-up the system without the aid of the WebPages. Press the **SEL** sequentially. The value displayed on the screen corresponds to the number corresponding to the /1 parameter. Action only valid when parameter H2 = 3

## Load Default Parameters:

The default parameter settings can be reloaded into the controller memory by using the special function described below

## Special Functions:

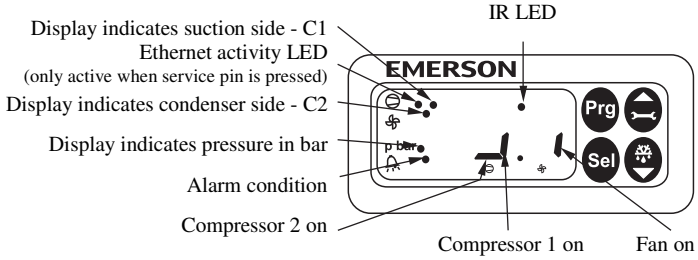
The Special Functions can be activated by:

- Press ▲ and ▼ together for more than 5 seconds.
  A flashing 0 is displayed.
- Press ▲ or ▼ until the password is displayed (default = 12). If password was changed, select the new password.
- Press **SEL** to confirm password
  A 0 is displayed and the Special Function mode is activated.
- Press ▲ or ▼ to select the function. The number of special functions is dynamic and controller dependent. See list below.
- Press **SEL** to activate the function without leaving the special function mode.
- Press **PRG** to activate the function and leave the special function mode.

Most of the Special Functions work in a toggle mode, the first call activates the function, and the second call deactivates the function.
The indication of the function can only be displayed after exiting the special function mode.

- 0: Display test function
- 1: Displays the current TCP/IP address
- 2: Set the controller TCP/IP address to the default value: 192.168.1.101
- 3: Resets all parameters to the factory default setting. The controller will indicate "oF" during the reset.

The data to be shown on the display can be selected by the user. In case of an alarm, the alarm code is displayed alternately with the selected data. The user can inhibit the alarm code. Press the SEL button to scroll through all possible displayable data.
The display will show for one second the numerical identifier of the data and then the selected data. After two minutes the display will return to the by parameter /1 selected data.




## Indications On The Display:

**Compressor Controller**

- State
- Alarm in combination with alarm message and alarm LED
- Suction pressure or saturation temperature from suction pressure
- Parameter

**Condenser fan controller**

- State
- Alarm in combination with alarm message and alarm LED
- Condensing pressure or saturation temperature from condensing pressure
- Parameter

**Other display**

- Pressure: Pressure value in bar (g)
- Alarm: Alarm condition
- IR: IR communication enabled

## Alarm Codes

***hP*** **High pressure alarm**
Controller 1: suction pressure higher than the maximum limit
Controller 2: condensing pressure higher than the maximum limit

***lP*** **Low pressure alarm**
Controller 1: suction pressure lower than the minimum limit
Controller 2: condensing pressure lower than the minimum limit

***d1*** **Discharge temperature alarm**
Digital scroll only: Discharge end temperature is too high

***EP*** **Error pressure**
Controller 1: suction pressure sensor failure
Controller 2: condensing pressure sensor failure

***Fr*** **Fast recovery alarm**
Controller 1: fast recovery from low suction pressure
Controller 2: fast recovery from low condensing pressure

***hr*** **High discharge pressure alarm**
Controller 1: high discharge pressure recovery
Controller 2: high discharge pressure recovery

***rE*** **Emergency run**
Controller 1: runs with c6 numbers of compressors
Controller 2: runs with c6 numbers of fans

***E1*** **Feedback alarm 1**
Controller 1: digital input associated with compressor 1 has changed into alarm state (safety chain)
Controller 2: digital input associated with fan(s) has changed into alarm state (safety chain)

***E2*** **Feedback alarm 2**
Controller 1: digital input associated with compressor 2 has changed into alarm state (safety chain)

***n1*** **Service alarm 1**
Controller 1: compressor 1 operating time higher than run limit (A9)
Controller 2: fan operating time higher than run limit (A9)

***n2*** **Service alarm 2**
Controller 1: compressor 2 operating time higher than run limit (A9)

***Er*** **Data error**
Data send to the display is out of range

## Messages

**---** **No data to display**
The display will show an "---" at node start up and when no data is send to the display.

***In*** **Reset to default values activated**
The display will show an "In" when the factory default configuration data set is initialized.

***Id*** **Wink request received**
The display will show a flashing "Id" when the wink request was received. The flashing "Id" will be shown on the display until the service button will be pressed, or a 30 min delay timer will expire or a second wink request is received. This function is action only when using SNMP protocol

***OF*** **Node is offline**
The node is offline and no application is running. This is the result of a network management command and will happen for example during node installation.

## Controller 1 (Compressor controller)

| / | DISPLAY PARAMETERS | Min | Max | Unit | Def | Individ. |
|---|---|---|---|---|---|---|
| /1 | Value to be shown on display<br>0 = compressors and fans states (controller 1 and 2)<br>1 = suction pressure (bar)<br>2 = saturation temperature from suction pressure (°C)<br>3 = condensing pressure (bar)<br>4 = saturation temperature from condensing pressure (°C)<br>5 = Digital Scroll capacity (%)<br>6 = fan speed (%)<br>7 = Digital Scroll discharge temperature (°C) | 0 | 7 | - | 0 | |
| **P** | **SET-POINT PARAMETERS - C1** | | | | | |
| P0 | Pressure set-point (suction) for compressor circuit | -1.0 | 50 | bar | 3.0 | |
| P1 | Pressure band (control band for P/PI, dead band for dead band control mode) | 0.0 | 50 | bar | 2.0 | |
| P3 | Fast recovery from low pressure | -9.9 | 50 | bar | -9.9 | |
| P8 | High discharge pressure recovery | -9.9 | 50 | bar | 50 | |
| **t** | **TIME PARAMETERS** | | | | | |
| t1[1] | Time delay before adding capacity | 0 | 99 | 10sec | 3 | |
| t2[1] | Time delay before removing capacity | 0 | 99 | 10sec | 3 | |
| t3[1] | Compressor minimum on time | 0 | 99 | 10sec | 6 | |
| t4[1] | Compressor minimum off time | 0 | 99 | 10sec | 6 | |
| t5 | Maximum compressor switching | 0 | 199 | 1/hr | 0 | |
| **A** | **ALARM PARAMETERS - C1** | | | | | |
| A2 | Minimum suction pressure alarm limit | -1.0 | 50 | bar | 1.0 | |
| A3 | Maximum suction pressure alarm limit | -1.0 | 50 | bar | 6.0 | |
| A4[1] | Delay time for minimum pressure alarm limit | 0 | 99 | 10sec | 0 | |
| A5[1] | Delay time for maximum pressure alarm limit | 0 | 99 | 10sec | 0 | |
| A6 | High discharge temperature cut-out cut-in = cut-out – 10°C | 100 | 140 | °C | 130 | |
| A8[1] | Compressor serial alarm delay | 0 | 99 | 10sec | 0 | |
| A9[2] | Compressor run limit | 0 | 99 | 10 000hr | 0 | |
| **u** | **STEP ENABLE PARAMETERS - C1** | | | | | |
| u0 | Reset operating time<br>0 = do nothing<br>1 = reset operating time compressor 1<br>2 = reset operating time compressor 2<br>3 = reset operating time all compressors | 0 | 3 | - | 0 | |
| u1 | Enable/disable compressor 1 | 0 | 1 | flag | 1 | |
| u2 | Enable/disable compressor 2 | 0 | 1 | flag | 1 | |
| **c** | **APPLICATION PARAMETERS - C1** | | | | | |
| c1 | Number of compressors | 1 | 2 | - | 2 | |
| c4 | Compressor 1 control mode<br>0 = compressor 1 in standard control loop<br>1 = compressor 1 act as base load compressor<br>2 = compressor 1 is a digital scroll compressor & base load | 0 | 2 | - | 2 | |
| c5 | Compressor switch logic<br>0 = FILO logic (First In, Last Out)<br>Capacity demand: Adds first compressor out of available compressors. (= compressors where min off time (t4) is fulfilled)<br>Capacity excess: Removes last compressor out of available compressors. (= compressors where min on time (t3) is fulfilled)<br>1 = Rotation enabled<br>Capacity demand: Adds compressor with lowest runtime out of available compressors. (= where min off time (t4) is fulfilled)<br>Capacity excess: Removes compressor with highest runtimes out of available compressors. (= where min on time (t3) is fulfilled) | 0 | 1 | flag | 0 | |
| c6 | Number of compressors to switch on in case of sensor failure | 0 | 2 | - | 0 | |
| **F** | **MODULATING PARAMETERS - C1** | | | | | |
| F2 | Minimum output value | 10 | 100 | % | 20 | |
| F3 | Maximum output value | 10 | 100 | % | 100 | |
| F6 | PWM rate (Digital scroll) | 10 | 20 | sec | 20 | |
| **r** | **SENSOR PARAMETERS - C1** | | | | | |
| r0 | Suction pressure sensor minimum value | -1.0 | 50 | bar | -0.8 | |

[1] Shown value x 10 = Time in seconds. Ex. a value of 2 means 20 seconds.
[2] Shown value x 10 000 = Time in hours. Ex. a value of 2 means 20.000 hours.

| | SENSOR PARAMETERS - C1 (continued) | Min | Max | Unit | Def | Individ. |
|---|---|---|---|---|---|---|
| r1 | Suction pressure sensor maximum value | -1.0 | 50 | bar | 7.0 | |
| r2 | Pressure offset for suction pressure | -1.0 | 1.0 | bar | 0.0 | |
| r3 | Refrigerant type<br>0 = no temperature conversion;<br>1=R22;2=R134a;3=R507;4=R404A;5=R407C;6=R407A;7=R407F | 0 | 7 | - | 4 | |

## Controller 2 (Fan controller)

| P | SET-POINT PARAMETERS - C2 | | | | | |
|---|---|---|---|---|---|---|
| P0 | Pressure set-point (condensing) for fan circuit | -1.0 | 50 | bar | 14.0 | |
| P1 | Pressure band (control band for P/PI, dead band for dead band control mode) | 0.0 | 50 | bar | 4.0 | |
| **A** | **ALARM PARAMETERS - C2** | | | | | |
| A2 | Minimum condensing pressure alarm limit | -1.0 | 50 | bar | 10.0 | |
| A3 | Maximum condensing pressure alarm limit | -1.0 | 50 | bar | 27 | |
| A4[1] | Delay time for minimum pressure alarm limit | 0 | 99 | 10sec | 0 | |
| A5[1] | Delay time for maximum pressure alarm limit | 0 | 99 | 10sec | 0 | |
| A9[2] | Fan run limit | 0 | 99 | 10kHr | 0 | |
| **u** | **STEP ENABLE PARAMETERS - C2** | | | | | |
| u0 | Reset operating time<br>0 = do nothing<br>1 = reset operating time fan 1 | 0 | 1 | - | 0 | |
| u1 | Enable/disable fan 1 | 0 | 1 | flag | 1 | |
| **c** | **APPLICATION PARAMETERS - C2** | | | | | |
| c2 | Fan controller operation<br>0 = disabled<br>1 = enabled | 0 | 1 | - | 1 | |
| c6 | Fan behaviour on in case of sensor failure<br>0 = Analog output 0% (0 V)<br>1 = Analog output 100% (10 V) | 0 | 1 | - | 0 | |
| **F** | **MODULATING PARAMETERS - C2** | | | | | |
| F2 | Minimum output value | 0 | 100 | % | 0 | |
| F3 | Maximum output value | 0 | 100 | % | 100 | |
| **r** | **SENSOR PARAMETERS - C2** | | | | | |
| r0 | Condensing pressure sensor minimum value | -1.0 | 50 | bar | 0.0 | |
| r1 | Condensing pressure sensor maximum value | -1.0 | 50 | bar | 30 | |
| r2 | Pressure offset for condensing pressure | -1.0 | 1.0 | bar | 0.0 | |
| **H** | **OTHER PARAMETERS** | | | | | |
| H2 | Keyboard and IR remote control<br>0 = all disabled<br>(Caution, access to controller only via network possible)<br>1 = Keyboard enabled<br>2 = IR remote control enabled<br>3 = Keyboard and IR remote control enabled | 0 | 3 | - | 3 | |
| H3 | IR remote control access code | 0 | 199 | - | 0 | |
| H5 | Password | 0 | 199 | - | 12 | |

## Visualising Data: WebPages

A **TCP/IP Controller-Readme** file is available on the www.emersonclimate.eu website to provide detailed information about TCP/IP Ethernet connectivity. Please refer to this file if you need information beyond the contents of this instruction sheet.

The **EC2-552** has a TCP/IP Ethernet communication interface enabling the controller to be directly connected to a PC or network via the standard Ethernet port. The **EC2-552** controller has embedded WebPages to enable the user to easily visualise the parameter lists using real text labels.

No special software or hardware is required.

Connect the **EC2-552** using the optional ECX-N60 cable assembly to a network or hub that enables the controller to receive a dynamic TCP/IP address. If a DHCP server is not available, the controller can be connected to a computer using a crossover cable plugged directly into the Ethernet port. In this case, the TCP/IP address of the computer must be manually modified to be compatible with the default address of the controller. Refer to the **TCP/IP Controller-Readme** file for more details.

Open the Internet browser program on the computer and enter the default TCP/IP address of the controller into the address line of the Internet browser: **192.168.1.101** or the dynamic address from the DHCP server. The default communication port is 1030. Refer to the **TCP/IP Controller-Readme** file if a specific port is required.

After a few moments, the default monitoring page should be displayed. If the browser does not open the default page or display active data, the user should check the Internet browser "Option" configuration. Refer to the **TCP/IP Controller-Readme** file.

In addition, for those customers wishing to connect the controllers into a larger system, it is also possible to trap network variables using the SNMP protocol. Refer to the **User Manual** for further details.

The Monitoring and Alarm WebPages are read only and therefore it is not necessary to enter a username or password. A username and password will be requested upon the initial request to any of the other WebPages. The factory default settings are :

**Username : EmersonID**

**Password : 12**

The default settings may be modified in the Display configuration page.

Press the tabs at the top of the Monitoring page with a left click of the mouse button to enter the respective Webpage.

The parameters will be visualised in real text together with the program code as defined in the parameter list below.

After the parameters have been modified, the complete list of settings can be saved to the memory of the computer and used later to upload into another controller. This can save a considerable amount of time when using multiple controllers and over a period of time, a library can be created containing the parameter lists for equipment for different applications.

It is also possible to display live graphical data from the controller. In addition, a permanent 30 days log file containing the control temperature at 15 minutes intervals is stored in the non-volatile memory to be later transferred using FTP to the computer. The log file can be imported into a standard spreadsheet program such as Excel. Refer to the **TCP/IP Controller-Readme** file for a complete description of the features available for the TCP/IP series of controllers.

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